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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/759,341	01/16/2004	Anthony C. Zuppero	16934-4005	7473

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ORRICK, HERRINGTON & SUTCLIFFE, LLP  
IP PROSECUTION DEPARTMENT  
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EXAMINER
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BARTON, JEFFREY THOMAS

ART UNIT	PAPER NUMBER
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1753

MAIL DATE	DELIVERY MODE
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06/21/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

**Application No.**

10/759,341

**Applicant(s)**

ZUPPERO ET AL.

**Examiner**

Jeffrey T. Barton

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 30 November 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) 1-24 and 32-35 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 25-31 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date See Continuation Sheet.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :20040116, 20041223, 20050121, 20050207, 20050317, 20060206, 20060213.

**DETAILED ACTION**

***Election/Restrictions***

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-9 and 32-35, drawn to a method of forming an energy converter, classified in class 438, subclass 49.
  - II. Claims 10-24, drawn to a method of forming an energy converter, classified in class 438, subclass 49.
  - III. Claims 25-31, drawn to an energy converter, classified in class 136, subclass 252.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are directed to related processes. The related inventions are distinct if the (1) the inventions as claimed are either not capable of use together or can have a materially different design, mode of operation, function, or effect; (2) the inventions do not overlap in scope, i.e., are mutually exclusive; and (3) the inventions as claimed are not obvious variants. See MPEP § 806.05(j). In the instant case, the inventions as claimed can have materially different design (e.g. no catalyst in the conducting surface of group I or no pn junction in group II). Furthermore, the inventions as claimed do not encompass overlapping subject matter and there is nothing of record to show them to be obvious variants.

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3. Inventions (I or II) and III are related as process of making and product made.

The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make another and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the converter of Group III can be made using a nonconductive tailoring material.

4. Because these inventions are independent or distinct for the reasons given above and there would be a serious burden on the examiner if restriction is not required because the inventions have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper.

5. Because these inventions are independent or distinct for the reasons given above and there would be a serious burden on the examiner if restriction is not required because the inventions require a different field of search (see MPEP § 808.02), restriction for examination purposes as indicated is proper.

6. During a telephone conversation with Jeffrey Miller and Jawahar Gidwani on 4 June 2007 a provisional election was made with traverse to prosecute the invention of Group III, claims 25-31. Affirmation of this election must be made by applicant in replying to this Office action. Claims 1-24 and 32-35 are withdrawn from further

consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

7. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

***Priority***

8. This application is a continuation in part of U.S. Application Serial No. 10/038,257. (Hereinafter '257 Application) However, the '257 Application does not provide full support for any of the instant claims. The '257 Application teaches formation of a catalytic surface (105) on an interlayer (106) that is formed on a non-conducting material (107). There is no support for the instantly claimed conducting surface/stabilizing interlayer/conductor/tailoring material/semiconductor structure in the '257 Application, and the effective filing date of this application is therefore considered to be 16 January 2004.

***Claim Rejections - 35 USC § 102***

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 25-31 are rejected under 35 U.S.C. 102(b) as being anticipated by Zuppero et al. (US 2002/0121088 A1)

Regarding claims 25 and 26, Zuppero et al teach an energy converter comprising: a conducting surface (102) on a stabilizing interlayer (103), the conducting surface and interlayer being formed from nanostructures (Paragraph 0090); the conducting surface being in contact with a region (114) that contains vibrationally energized species in operation (Paragraph 0080; the interlayer conductor (102) being formed on a conductor that is a nanolayer (110; Paragraphs 0090 - 0092); the conductor (110) being formed on a tailoring material (111) that is a nanolayer (Paragraphs 0090-0093); and the tailoring conductor (111) being formed on a semiconductor. (Layers 104-106; Paragraph 0100) The term “nanostructure” is read broadly in accordance with the specification, which indicates that “nanolayers” are considered to be nanostructures. (e.g. Page 12, line 25 - Page 13, line 6) A “nanolayer” is considered to be a layer of nanometer-scale thickness (i.e. 1-1000 nm)

Regarding claim 27, Zuppero et al disclose interlayer 102 being formed on the contact of a Schottky junction (i.e. layer 110). (Paragraphs 0062 and 0093)

Regarding claim 28, Zuppero et al disclose that layer 110 is an ohmic contact material. (Paragraph 0106)

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Regarding claim 29, Zuppero et al disclose that the semiconductor comprises a pn junction. (Paragraphs 0100-0101; Figure 1 regions 104-15)

Regarding claim 30, Zuppero et al disclose providing the semiconductor on a substrate. (Paragraph 0084; common substrate represented by the plane of the illustration of Figure 1)

Regarding claim 31, any substrate material will have finite heat conductivity, and will therefore conduct heat.

### ***Claim Rejections - 35 USC § 103***

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.



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13. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

14. Claims 25-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hatano et al (US 5,740,192) in view of Okada et al. (Japan. J. Appl. Phys. reference) Supporting evidence is provided by Hirsch et al. (J. Electron. Mater. reference)

Hatano et al disclose an energy converter comprising: a Pt/Ti/Pt/Au multilayer contact stack in contact with a semiconductor. (Figure 14, Contact 722 over layers 713/712/711; Column 24, lines 25-50) Hatano et al describe a semiconductor laser (Column 24, lines 26-27), which converts electrical energy to electromagnetic radiation, thus corresponding to a broadly recited "energy converter". The semiconductor includes a pn junction as required in claim 29 (Figure 14), and the semiconductor is formed on a sapphire substrate, which is heat-conductive, meeting the limitations of claims 30 and 31.

Hatano et al do not explicitly disclose the thickness of the respective metal layers in the contact stack.

Okada et al teach an ohmic contact to a p-type III-V semiconductor comprising a multilayer stack of Pt (10 nm)/Ti (40 nm)/Pt (10 nm)/Au (100 nm). (Paragraph bridging pages L558 and L559) Okada et al teach that this contact provides very low contact resistance. (Abstract)

It would have been obvious to one having ordinary skill in the art to modify the method of Hatano et al by specifically using the layer thicknesses taught by Okada et al, because Okada et al teaches that this contact structure provides low contact resistance. In addition, the silence of Hatano et al regarding the thicknesses of the layers in contact 722 would have led one having ordinary skill to turn to the prior art, such as Okada et al, to select thicknesses known to be appropriate for contact layers.

Regarding claims 25 and 26, the term “nanostructure” is read broadly in accordance with the specification, which indicates that “nanolayers” are considered to be nanostructures. (e.g. Page 12, line 25 - Page 13, line 6; Claim 7) A “nanolayer” is considered to be a layer of nanometer-scale thickness (i.e. 1-1000 nm) Therefore, the metal layers taught in this combination meet the limitations to “nanostructures” and “nanolayer”.

In this combination the lower Pt layer reads on the “tailoring material”, the Ti layer on the “ohmic contact conductor”, the upper Pt layer on the “stabilizing interlayer”, and the Au layer on the “conducting surface”. Note also that Ti is known to form Schottky junctions with GaN (Hirsch et al), and therefore corresponds to the “Schottky conductor” of claim 27.

It is the examiner's position that undue weight cannot be given to the limitation that the conducting surface is in contact with a region "for containing vibrationally energized species", since this corresponds to a recitation of intended use of the structure. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). In this case, any gas, including one containing vibrationally energized species, could occupy the space surrounding the top electrode in the device taught by the combination of Hatano et al and Okada et al. Aside from this, the references are considered to meet this limitation. Since the upper electrode surface (i.e. the gold layer) will be exposed to ambient, the limitation to the nanostructures of the conducting surface being "in contact with or near a region for containing vibrationally energized species" is inherently met, since any material at a temperature above absolute zero has vibrational energy. Air at, e.g. 300K, will clearly have numerous gaseous species with nonzero vibrational energy.


### **Conclusion**

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Jeffrey T. Barton whose telephone number is (571) 272-1307. The examiner can normally be reached on M-F 9:00AM - 5:30PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
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JTB  
5 June 2007